

DESCRIPTION

DIAPHRAGM AND LOUDSPEAKER USING SAME

5 TECHNICAL FIELD

The present invention relates to a diaphragm and a loudspeaker using the same.

BACKGROUND ~~ART~~ OF THE INVENTION

10 Each loudspeaker generates natural resonance vibration frequency.
— Therefore, ~~a~~the reproduction level fluctuates
~~extraordinary~~extraordinarily at the resonance vibration frequency compared
with other frequencies, so that it is difficult to flatten reproduction frequency
characteristics ~~are difficult to be flattened~~. As a result, ~~there is a problem~~
15 ~~that~~ a signal can not be reproduced appropriately.

To solve this problem, Unexamined Japanese Patent Publication No.
H7-162992, discloses that ~~a~~the resonance level of a diaphragm at the natural
vibration frequency can be suppressed by making ~~a~~the outer periphery of
the diaphragm an oval figure, for example.

20 As in the example discussed above, making the outer periphery of the
diaphragm an oval figure, for example, has a certain effect ~~for~~of suppressing
the resonance level at the natural vibration frequency. However, the high
resonance level at the natural vibration frequency ~~is still becoming~~remains a
problem.

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SUMMARY OF THE INVENTION

~~A~~One embodiment of the present invention relates to a diaphragm

for a loudspeaker that has a shape overlapping a first circle and a second circle in a top view of ~~an~~the outer periphery shape of the diaphragm,

Where in the first circle has a first center point and a first radius, and the second circle has a second center point different from the first center point
 5 and a second radius different from the first radius. By forming ~~the~~this shape—discussed—above, signal reproduction characteristics can be significantly flattened~~as much as possible~~.

BRIEF DESCRIPTION OF THE DRAWINGS

10 Fig. 1 is a sectional view of a loudspeaker in accordance with an exemplary embodiment of the present invention.

Fig. 2 is a plan view of a diaphragm in accordance with the exemplary embodiment of the present invention.

Fig. 3 is a plan view showing a shape of the diaphragm in accordance
 15 with the exemplary embodiment of the present invention.

Fig. 4 is a signal reproduction characteristic in accordance with the exemplary embodiment of the present invention.

REFERENCE MARKS IN THE DRAWINGS

- 20 1 frame
- 2 magnetic circuit
- 3 magnet
- 4 yoke
- 5 plate
- 25 6 magnetic gap
- 7 voice coil
- 9 diaphragm

9A first circle

9B second circle

9C third circle

9a, 9b, 9c center point

5 10 through-hole

12, 14 edge

12a cushion part

12b, 12c flange

13 dumper

10 15 fixing part

100 loudspeaker

DETAILED DESCRIPTION OF ~~PREFERRED EMBODIMENTS~~THE INVENTION

15 ~~The inventor considers the reason that~~Embodiments of the present invention address the difficulty in suppressing fluctuation of ~~a~~the resonance level at a natural vibration frequency ~~is difficult to be suppressed in a conventional diaphragm as follows. In~~For example, in an oval diaphragm, when a plurality of center lines are drawn from an outer periphery to a center
20 point, each center line has a constant distance at the same angle position in right and left directions with respect to the center point. ~~The inventor has found that this~~This is the reason that the resonance level can not be reduced as expected.

~~A diaphragm~~Embodiments of the present invention ~~is characterized by~~
25 ~~are directed to the shape of its~~a diaphragm's outer periphery. The shape of the outer periphery of this diaphragm is formed as follows: A first circle and a second circle ~~are overlapped~~overlap each other with their center points

displaced in such a manner that at least one part of an outer periphery of the first circle and the second circle forms a part of the substantially circular outer periphery of ~~an~~the entire shape of the diaphragm. Using this shape, most center lines drawn from an edge of the outer periphery to the center point have different distances ~~at~~on a right side and a left side from the center point of the diaphragm. This can reduce the resonance level ~~remarkably~~considerably. As a result, signal reproduction characteristics can be flattened ~~as much as possible~~significantly.

Exemplary embodiments of the present invention are demonstrated hereinafter with reference to the accompanying drawings.

Fig. 1 is a sectional view of loudspeaker 100 in accordance with the exemplary embodiment of the present invention. Loudspeaker 100 shown in Fig. 1 accommodates magnetic circuit 2 at an inner bottom surface of dish-shaped frame 1. Magnetic circuit 2 includes magnet 3, yoke 4 and plate 5. Magnetic gap 6 is formed between yoke 4 and a tip of plate 5.

Coil part 8 which is a lower end part of cylindrical voice coil 7 is movably accommodated in magnetic gap 6. In addition, an upper end of voice coil 7 penetrates through-hole 10 of a center of diaphragm 9 and projects upward. Voice coil 7 and diaphragm 9 are fixed at the penetrating position by using an adhesive. Moreover, cap 11 covers an upper end of voice coil 7.

As shown in Figs. 1 and 2, diaphragm 9 has through-hole 10 for fixing voice coil 7 at its center part, and has fixing part 15 of edge 12 at its outer periphery whose shape is substantially circular. The shape of the outer periphery of diaphragm 9 is formed as follows: First circle 9A and second circle 9B ~~are overlapped~~overlap each other with their center points 9a and 9b are displaced in such a manner that at least one part of an outer periphery of

the first circle and the second circle forms a part of the substantially circular outer periphery of ~~an~~the entire shape.

Using Fig. 3 ~~of a,~~ which illustrates a schematic top view of diaphragm 9, the shape of the diaphragm is described hereinafter in more detail. First circle 9A has radius R_a and center point 9a. Second circle 9B has radius R_b and center point 9b. Third circle 9C has radius R_c and center point 9c, and surrounds first circle 9A and second circle 9B. Further, third circle 9C contacts an outer periphery of first circle 9A at point Xa on line X-X, and contacts an outer periphery of second circle 9B at point Xb on line X-X. The outer periphery of first circle 9A and the outer periphery of second circle 9B cross each other at point A and point B. A solid line denotes the outer periphery of diaphragm 9. ~~In a word, the~~The outer periphery of small circle 9B whose radius is R_b is shown from point A to point B in clockwise direction, and the outer periphery of large circle 9A whose radius is R_a is shown from point B to point A in clockwise direction. Most center lines drawn from the outer periphery of the diaphragm 9 to center point 9c of third circle 9C have different distances ~~at~~on the right side and the left side of center point 9c. For example, distance L_m , which is defined as a distance from center point 9c to the outer periphery of first circle 9A at angle T_0 with respect to line Y-Y in a left direction, differs from distance L_n , which is defined as a distance from center point 9c to the outer periphery of second circle 9B at angle T_0 with respect to line Y-Y in a right direction. However, distances ~~at~~on the right side and the left side ~~become~~are the same only at center line X-X. This ~~causes~~structure significantly reduces the resonance level ~~to reduce~~ remarkably. As a result, as shown in Fig. 4, the signal reproduction characteristics ~~can be~~are flattened (line A) as compared with a conventional diaphragm, shown as line B. Particularly, the frequency characteristic at

near 10 kHz is considerably flattened as compared with a conventional
~~one~~diaphragm. In Fig. 4, SPL stands for "output sound pressure level" and
 is shown as a value of dB.

~~According to edge 12 shown in~~As shown in Fig. 1, cushion part 12a,
 5 which protrudes upward and has a semicircular cross section, ~~forms~~form a
 circular shape as shown in Fig. 2. In addition, circular flange 12b for ~~being~~
~~fixed at~~fixing to frame 1 is formed at an outer periphery of cushion part 12a,
 and circular flange 12c for ~~being fixed at~~fixing to diaphragm 9 is formed at an
 inner periphery of cushion part 12a.

10 An end of an inner periphery of ring-shaped dumper 13 is fixed to a
 lower surface of diaphragm 9, and an end of an outer periphery of dumper 13
 is fixed to frame 1 via edge 14.

INDUSTRIAL APPLICABILITY

15 According to a diaphragm of the present invention, signal reproduction
 characteristics can be flattened as compared with a conventional
~~one~~diaphragm, so that appropriate signal reproduction can be performed ~~by~~
~~adopting it in~~ a loudspeaker.

ABSTRACT

Diaphragm (9) ~~A diaphragm~~ has a through-hole (10) for fixing a voice coil at its center part, and has a fixing part of an edge (12) at its outer periphery ~~whose shape~~ which is substantially circular. The shape of the outer periphery of diaphragm (9) is formed as follows: a first circle and a second circle (9A, 9B) ~~are overlapped~~ overlap each other with their center points (9a, 9b) displaced in such a manner that at least one part of an outer periphery of the first circle and the second circle (9A, 9B) forms a part of the substantially circular outer periphery of ~~an~~ the entire shape. ~~Signal~~ Using this structure, signal reproduction characteristics can significantly be flattened ~~as much as possible~~ by reducing ~~a~~ the resonance level.